

FORM PTO-1590
(REV 5-93)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

99002 UTAP

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/980032

PE TRANSMITTAL LETTER TO THE UNITED STATES
1 2001 DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

INTERNATIONAL APPLICATION NO.
PCT/SE00/00229INTERNATIONAL FILING DATE
February 7, 2000PRIORITY DATE CLAIMED
June 4, 1999

TITLE OF INVENTION

Tube-Formed Rock Bolt

APPLICANT(S) FOR DO/EO/US

Thomas Arvidsson

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. A copy of the International Application as filed (35 U.S.C. 371(c)(2)) *
 - a. is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. has been transmitted by the International Bureau.
 - c. is not required, as the application was filed in the United States Receiving Office (RO/US)
6. A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. have been transmitted by the International Bureau.
 - c. have not been made; however, the time limit for making such amendments has NOT expired.
 - d. have not been made and will not be made.
8. A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. A FIRST preliminary amendment.
 A SECOND or SUBSEQUENT preliminary amendment.
14. A substitute specification.
15. A change of power of attorney and/or address letter.
16. Other items or information: Copy of International Preliminary Examination Report
Express Mail Certificate

* including 2 sheets of drawing (Figs. 1 - 3) and copy of
International Search Report

JCIS Rec'd PCT/PTO 27 NOV 2001

09/980032

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17. <input checked="" type="checkbox"/> The following fees are submitted:		CALCULATIONS PTO USE ONLY	
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO.....		\$830.00x	
International preliminary examination fee paid to USPTO (37 CFR 1.482)		\$140.00x	
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).		\$210.00	
Neither international preliminary examination fee (37 CFR 1.482) nor 1040 international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....		\$250.00x	
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....		\$90.00	
ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 1040			
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).			
\$ -----			
Claims	Number Filed	Number Extra	Rate
Total Claims	12 * -20 =	-----	X \$22.00 \$ -----
Independent Claims	1 - 3 =	-----	X \$74.00 \$ -----
Multiple dependent claims(s) (if applicable)		-----	+ \$230.00 \$ -----
TOTAL OF ABOVE CALCULATIONS = \$ 1040			
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).			
\$ -----			
SUBTOTAL = \$ 1040			
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			
+ \$ -----			
TOTAL NATIONAL FEE = \$ 1040			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + \$ 40			
TOTAL FEES ENCLOSED = \$ 1080			
*See Preliminary Amendment		Amount to be:	
		refunded	\$
		charged	\$
a. <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed.			
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.			
c. <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.			
<input checked="" type="checkbox"/> Credit Card Payment Form enclosed			
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.			
SEND ALL CORRESPONDENCE TO:			
<p>MARK P. STONE 1100 HIGH RIDGE ROAD SUITE 205 STAMFORD, CONNECTICUT 06905 (203) 329-3355</p>			
<p><i>Mark P. Stone 11/27/01</i></p> <p>SIGNATURE</p> <p>Mark P. Stone</p> <p>NAME</p> <p>Reg. No. 27,954</p> <p>REGISTRATION NUMBER</p>			

99002 UTAP

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Applicant: Thomas Arvidsson

United States National Phase of
PCT/SE00/00229, Filed February 7, 2000

Title: Tube-Formed Rock Bolt

Commissioner for Patents
Washington, D.C. 20231

Attn: PCT-US/EO

PRELIMINARY AMENDMENT

Preliminary to the examination of the above identified United States patent application, please make the following amendments.

IN THE SPECIFICATION

Please add the Abstract of Disclosure, attached hereto on a separate sheet.

IN THE CLAIMS

Please amend Claims 3, 4 and 5; and add new Claims 6 - 12. Revised and replacement Claims 3 - 5, and new Claims 6 - 12, are attached hereto on separate sheets.

REMARKS

The specification of the United States National Phase of the above identified PCT International application has been amended to include an Abstract of the Disclosure, corresponding to the Abstract appearing on the cover sheet of the published PCT application.

The original claims of the PCT application have been revised to delete the multiple dependent format thereof. New Claims 6 - 12 have been added. Claim 6 corresponds to original Claim 3/2; Claim 7 corresponds to original Claim 4/2; Claim 8 corresponds to original 4/3; Claim 9 corresponds to original Claim 4/3/2; Claim 10 corresponds to original Claim 5/2; Claim 11 corresponds to original Claim 5/3; and Claim 12 corresponds to original Claim 5/3/2.

Respectfully submitted,



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File No. 99002

PCT/SE00/00229

REVISED CLAIMS 3 - 5

Claim 3. (amended) Tube-formed rock bolt according to claim 1 [or 2], characterized [thereby] in that said tube (1) comprises an aluminum-based material.

Claim 4. (amended) Tube-formed rock bolt according to [any of claims 1 - 3] claim 1, characterized [thereby] in that said tube (1) is symmetrical about two longitudinal sections (6, 7) which are perpendicular relative to each other.

Claim 5. (amended) Tube-formed rock bolt according to [any of claims 1 - 3] claim 1, characterized [therby] in that said tube (1) comprises a [number] plurality of substantially triangularly formed stiff parts (8) and intermediate U-shaped deformation parts (9).

REPLACEMENT CLAIMS 3 - 5

Claim 3. (amended) Tube-formed rock bolt according to claim 1, characterized in that said tube (1) comprises an aluminum based material.

Claim 4. (amended) Tube-formed rock bolt according to claim 1, characterized in that said tube (1) is symmetrical about two longitudinal sections (6, 7) which are perpendicular relative to each other.

Claim 5. (amended) Tube-formed rock bolt according to claim 1, characterized in that said tube (1) comprises a plurality of substantially triangularly formed stiff parts (8) and intermediate U-shaped deformation parts (9).

File No. 99002

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NEW CLAIMS 6 - 12

Claim 6. Tube-formed rock bolt according to claim 2, characterized in that said tube (1) comprises an aluminum-based material.

Claim 7. Tube-formed rock bolt according to claim 2, characterized in that said tube (1) is symmetrical about two longitudinal sections (6, 7) which are perpendicular relative to each other.

Claim 8. Tube-formed rock bolt according to claim 3, characterized in that said tube (1) is symmetrical about two longitudinal sections (6, 7) which are perpendicular relative to each other.

Claim 9. Tube-formed rock bolt according to claim 6, characterized in that said tube (1) is symmetrical about two longitudinal sections (6, 7) which are perpendicular relative to each other.

Claim 10. Tube-formed rock bolt according to claim 2, characterized in that said tube (1) comprises a plurality of substantially triangularly formed stiff parts (8) and intermediate U-shaped deformation parts (9).

Claim 11. Tube-formed rock bolt according to claim 3, characterized in that said tube (1) comprises a plurality of substantially triangularly formed stiff parts (8) and intermediate U-shaped deformation parts (9).

Claim 12. Tube-formed rock bolt according to claim 6, characterized in that said tube (1) comprises a plurality of substantially triangularly formed stiff parts (8) and intermediate U-shaped deformation parts (9).

99002 UTAP

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Applicant: Thomas Arvidsson

United States National Phase of
PCT/SE00/00229, Filed February 7, 2000

Title: Tube-Formed Rock Bolt

Commissioner for Patents
Washington, D.C. 20231

Attn: PCT-US/EO

ABSTRACT OF THE DISCLOSURE

- -A tube-formed rock bolt has a closed profile for anchoring in a bore hole. The bolt is anchored in the bore hole through internal pressurization with a fluid, such as water, so that the diameter of the bolt is plastically expanded into contact with the wall of the hole. The bolt has, prior to expansion, a cross-section having a peripheral length exceeding the circumference of the hole, and a maximum diameter which is smaller than that of the hole. The tube has a variable wall thickness in a peripheral direction for obtaining a profile sufficiently flexible for expansion while simultaneously having a sufficiently large cross sectional area for providing strength. The tube-formed bolt can be produced by extrusion of an aluminum-based material.- -

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Tube-formed rock bolt

The present invention relates to a tube-formed rock bolt with closed profile, which is inserted in a bore hole and then expanded into contact with the wall of the bore hole through plastic deformation by means of internal pressurisation.

In a previously known rock bolt, see e.g. US-A-4 509 889, a comparatively thin-walled tube of mild steel is used, which during manufacture is deformed such that its peripheral length is larger than the circumference of the bore hole. A drawback with this formation is that the tube is relatively thin-walled in order to allow deformation against the wall of the bore hole. This gives a comparatively small cross-sectional area, which restricts the tensile strength of the rock bolt. The unsymmetrical form of the rock bolt gives as result that the contact force against the rock varies along the periphery, which limits the load carrying capacity. A further drawback is that the steel material is exerted to corrosion attack.

The present invention, which is defined in the subsequent claims, aims at achieving a tube-formed rock bolt having a substantially higher tensile strength. This is achieved primarily because the rock bolt comprises a tube, which has a material thickness varying along the periphery. Through this one can increase the cross-sectional area of the tube substantially at the same time as one has parts, which are easily deformed so that the rock bolt gets a secure grip against the wall of the bore hole. The advantageous embodiments of the invention given in the subclaims give as results that the rock bolt obtains good corrosion resistance, is easy to manufacture and gives a good contact force against the wall of the bore hole around the hole.

Two embodiments of the invention are described below with reference to the accompanying drawings in which fig 1 shows a tube-formed rock bolt in perspective with one end closure removed in order to show the cross-sectional form. Fig 2 shows a cross section through the bolt according to fig 1 and schematically the surrounding bore hole in which the rock bolt is to be anchored. Fig 3 shows an alternative embodiment of the invention.

The tube-formed rock bolt shown in the drawings comprises an elongated tube 1 provided with two end closures 2,3. In the shown example the end closures are made as caps, which sealingly have been connected with the tube 1. Through this a room 5 is created between the tube 1 and the end closures 2,3. This room can be pressurised via a passage 4 at the end closure 2. The end closures can be achieved in other ways. The essential is that the ends of the tube 1 are sealed so that one through pressurisation of the room 5 can expand the tube 1 to contact against the bore hole 11. The tube 1 is, for instance, made by means of extrusion of an aluminium-based material, e.g. EN-AW 6082-T4. The tube 1 can thereby advantageously be given cross-sectional forms like those shown in figs 2 and 3. By making the profile symmetrical relative to the longitudinal sections 6,7 one obtains a relatively even distribution of the contact force between the tube 1 and the bore hole 11 after expansion of the bolt. One obtains about the same result with the bolt form shown in fig 3. This means that the bolt can be loaded more heavily without gliding in the bore hole. The bolt shown in fig 2 comprises four substantially triangularly formed parts 8, which have large cross-sectional areas and thus large stiffness and tensile strength. These parts are connected by means of U-shaped deformation parts 9. In order to increase the flexibility the tube profile has been provided with a number of circularly formed parts 12 at the deformation parts 9.

When a rock bolt is to be anchored in a bore hole the bolt is pushed into the bore hole with the end closure 3 at the inner end of the bore hole. Then pressure fluid is supplied via the passage 4 to the room 5 surrounded by the tube 1. Through this the tube 1 is expanded so that it contacts the wall of the bore hole 11 hardly. Then the room 5 is unloaded whereby the tube 1 remains firmly anchored, since the previous expansion has deformed the tube 1 plastically.

The invention can, of course, be varied within the scope of claim 1. The profile can, for instance, have more or fewer than four stiff parts. An example of this is shown in fig 3.

Claims:

1. Tube-formed rock bolt comprising an elongated tube (1), which in a cross section has a peripheral length which exceeds the peripheral length of a circle having a diameter being equal to the largest transverse dimension of said tube, two end closures (2,3) on said tube and a passage (4) at one of said end closures (2,3) for pressurisation of a room (5) surrounded by said tube (1) for expansion of said tube against a bore hole, characterized thereby that said tube (1) has a varying material thickness in a peripheral direction.
2. Tube-formed rock bolt according to claim 1, characterized thereby that said tube (1) is manufactured by means of extrusion.
3. Tube-formed rock bolt according to claim 1 or 2, characterized thereby that said tube (1) comprises an aluminium-based material.
4. Tube-formed rock bolt according to any one of claims 1-3, characterized thereby that said tube (1) is symmetrical about two longitudinal sections (6,7) which are perpendicular relative to each other.
5. Tube-formed rock bolt according to any one of claims 1-3, characterized thereby that said tube (1) comprises a number of substantially triangularly formed stiff parts (8) and intermediate U-shaped deformation parts (9).

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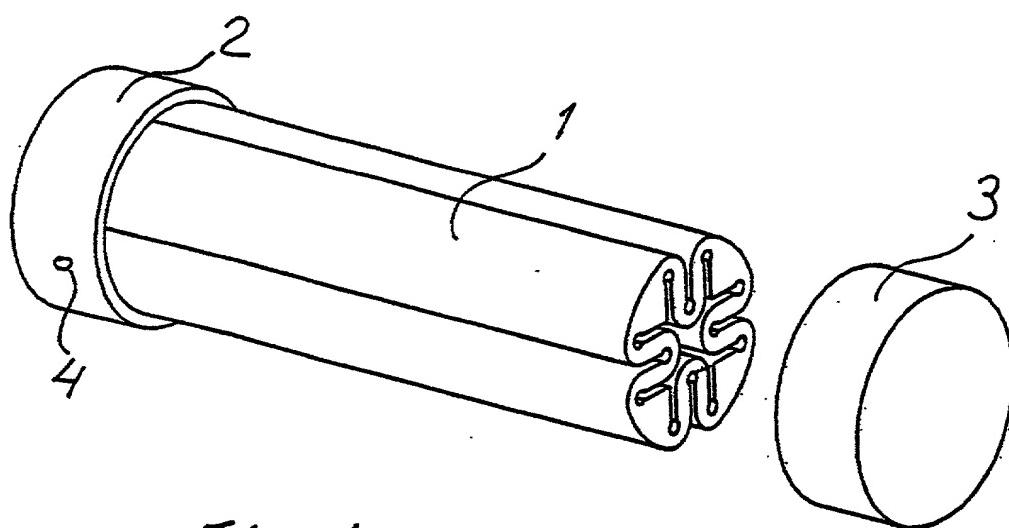


Fig. 1

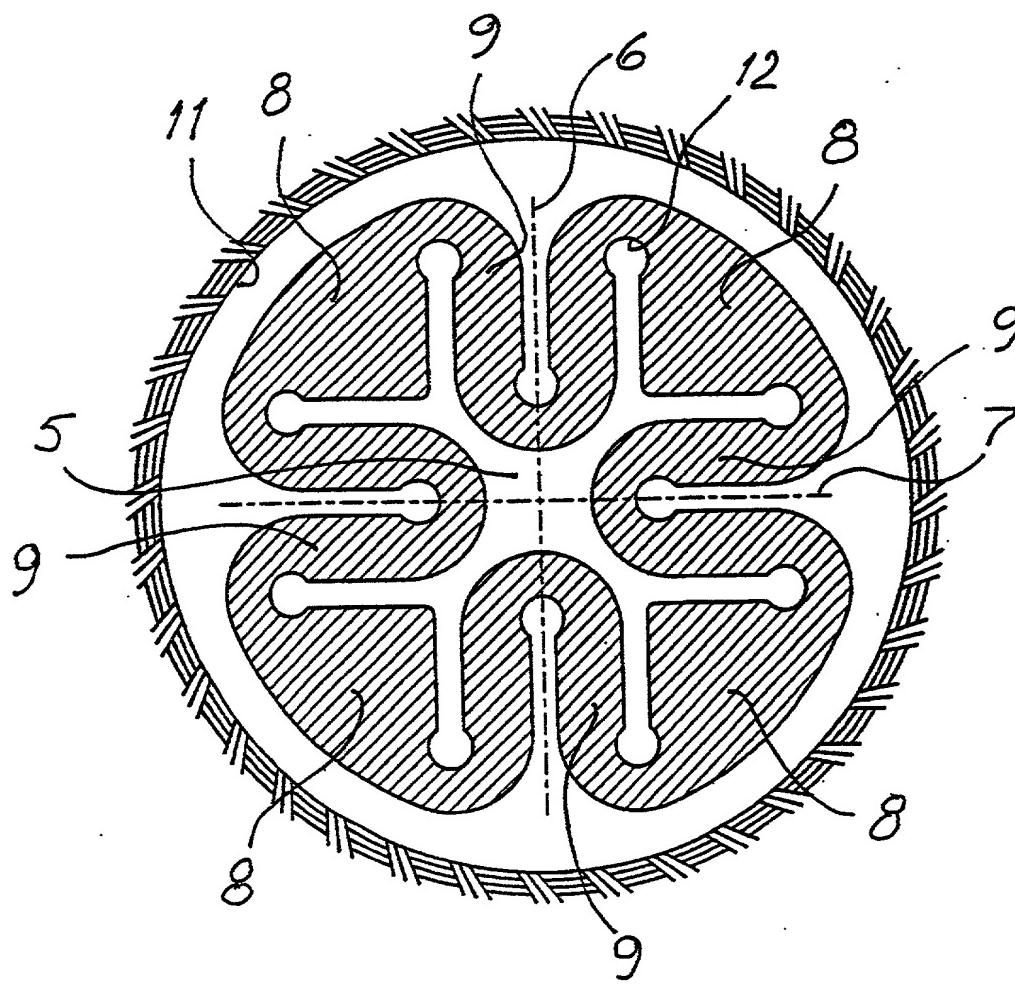


Fig. 2

2/2

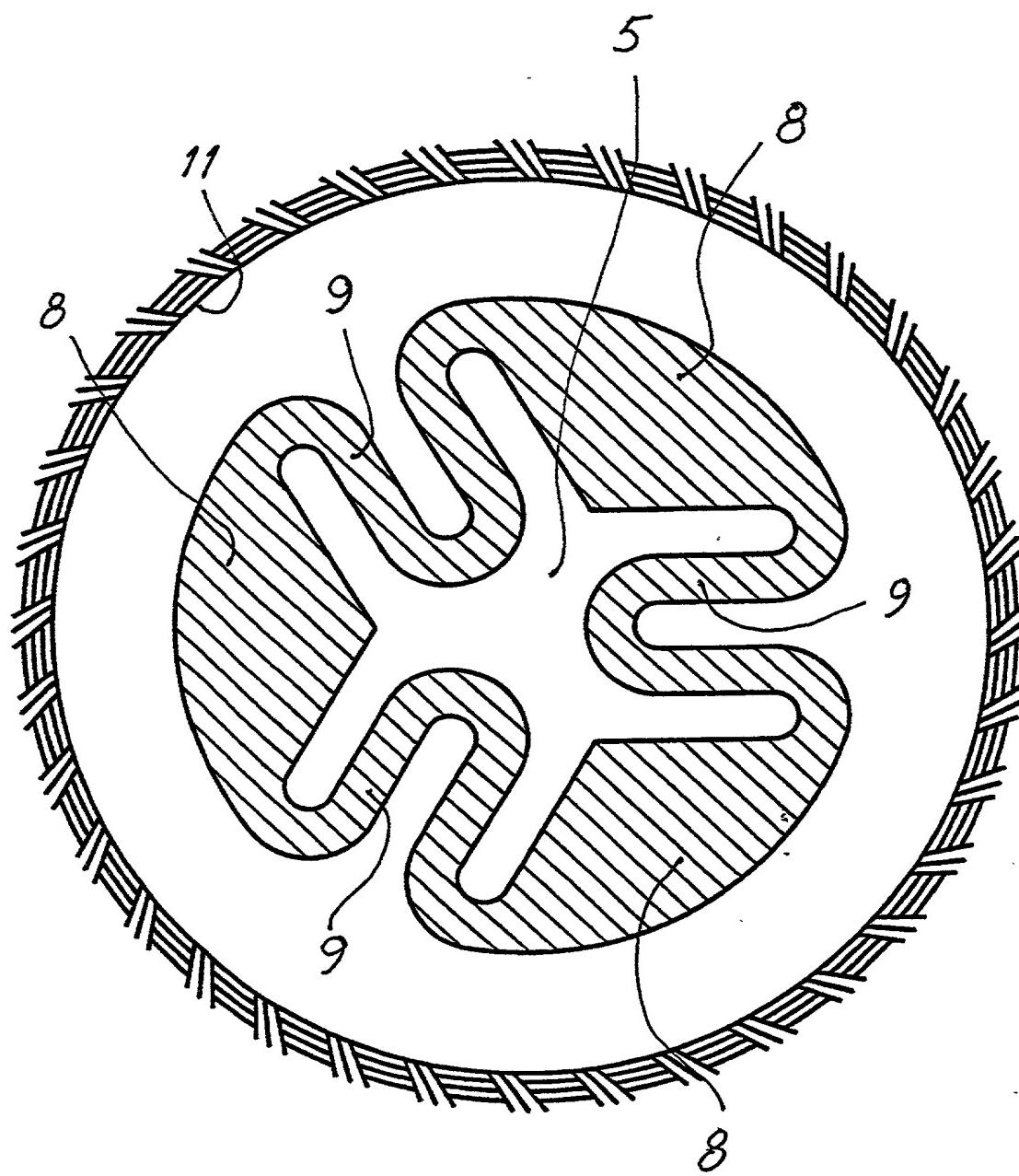


Fig. 3

APPLICATION FOR UNITED STATES LETTERS PATENT

ATTORNEY'S DOCKET NO.

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:
 My residence, post office address and citizenship are as stated next to my name; and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which patent is sought on the invention entitled

Tube-formed rock bolt

the specification of which

(check one) is attached hereto
 was filed on 7 February 2000 as

Application Serial No. PCT/SE00/00229

and was amended on

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(e).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)	Priority Claimed			
9902065-3 (Number)	SE (Country)	4 June 1999 (Day/Month/Year Filed)	X Yes	No
 (Number)	 (Country)	 (Day/Month/Year Filed)	 Yes	 No
 (Number)	 (Country)	 (Day/Month/Year Filed)	 Yes	 No
 (Number)	 (Country)	 (Day/Month/Year Filed)	 Yes	 No

I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent & Trademark Office connected therewith:
 MARK P. STONE, Reg. No. 27,954, 1100 High Ridge Road, Suite 205, Stamford, Conn. 06905

SEND CORRESPONDENCE TO: Mark P Stone
1100 High Ridge Road, Suite 205
Stamford, Connecticut 06905

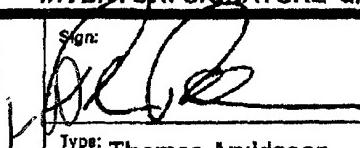
Tel. (203) 329 3355

Fax. (203) 329 3729

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR: SIGNATURE and DATE

RESIDENCE AND POST OFFICE ADDRESS

2	Sign: 	Date: <u>November 26, 2001</u>	<u>Järntorgsgatan 12</u> <u>SE-703 61 ÖREBRO</u> <u>Sweden</u> 
2 0 2	Sign:	Date:	
	Type: <u>Thomas Arvidsson</u>	Citizen of: <u>Sweden</u>	
2 0 3	Sign:	Date:	
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